

METHOD AND SYSTEM FOR HIGH-RESOLUTION MODELING
OF A WELL BORE IN A HYDROCARBON RESERVOIR

ABSTRACT OF THE INVENTION.

[0091] A method and system are disclosed for high-resolution modeling of a well bore in a reservoir. An embodiment of the present invention comprising the steps of constructing a first unstructured mesh, having a plurality of n-dimensional simplices, corresponding to a first modeled system (space), defining a surface bounding a second modeled space, identifying a subset of the plurality of n-dimensional simplices of the first mesh that are intersected by the surface, and modifying the subset of simplices so as to adapt the first mesh such that it comprises a second mesh and a third mesh, wherein the second mesh comprises a set of simplices located entirely interior to the surface and wherein the third mesh comprises another set of simplices located entirely exterior to said surface. In this way, new elements are defined within the intersected elements such that one or more of the faces of the new elements are substantially coincident with said surface (that is, they lie approximately on the surface), and such that some of said new elements lie entirely within the volume defined by said surface, and other elements entirely outside of said volume. More specifically, for each element that is intersected by the surface, a set of points at which the faces, edges or vertices of the element are intersected by the surface is determined (if the element is only intersected at a single point, it need not be subdivided into two or more new elements). At each point of intersection, a new node is created (if the point of intersection is not a node) and two new elements that incorporate the new node are generated. This process is performed for each point of intersection to subdivide the intersected element into a number of new simplex elements, some of which comprise faces that lie substantially on the modeled surface.